In response to the claim rejections under 35 U.S.C. § 112, first and second paragraphs, a comparison of the Russian language PCT application by the Applicants has revealed that the English language translation for original claim 6 of that application was inexact and that the second word after "0,4-0,6" should have been translated as "basin of the furnace" instead of "inner space height" or firing space of the furnace. With this more accurate translation it is clear that the "height of basin" of the furnace is the height of the part of the furnace occupied by the melted glass mass (from the level of the upper surface of the melt to the bottom of the firing space of the furnace).

Also, as shown in the original figure, the level of the melt of the firing space and in the stabilizing section is the same and the disclosure pertaining to "0,4-0,6" of the basin of the furnacc and stabilizing scction interrelationship is noted by Applicants as being readily understood as concerning the heights extending from the bottom of each respective chamber (firing space and stabilizing section) to the surface of the glass mass. This relationship is appropriately illustrated in the originally filed Figure so as not to require any drawing changes (those prepared in the earlier presented and rejected proposed drawing amendment are not required).

Thus, as can be seen, the bottom wall surface of the stabilizing section is higher than the bottom of the firing space of the furnace, which provides for the preferred stabilized activity outlined below and also provides for avoiding waste in the bottom part of the furnace basin being delivered to the stabilizing section as well as periodic draining.

In view of the more accurate verified translation revision and noting that the original Russian language PCT application was incorporated by reference in the present application, it is

respectfully submitted hat no new matter has been introduced in the changes made to the specification and the corresponding claim changes concerning the ".4 to .6" relationship.

Also, within the accompanying claim amendments, the objectionable wording concern is not present so as to render non-applicable the rejections under 35 U.S.C. § 112, first and second paragraphs.

Claims 1-7, and 21-29 stand rejected under 35 U.S.C. § 103(a) as being considered unpatentable over Austin 4,149,866 in view of Shofner 4,343,637 and Naber 4,940,478 and optionally in view of Sorg 5,573,569.

Prior to discussing the obviousness rejections, the Applicants provide the following additional background to facilitate the non-obviousness discussion below relative to certain rejected claims.

Manufacturing processes of producing basalt mass for pulling continuous basaltic fibers and of producing glass mass for pulling continuous glass fibers are not identical. The former is much more difficult. Basalts and rocks of the basalt group are highly non-uniform not only from the standpoint of different deposits but also relative to the rocks of one deposit (see tables 1-4 of the application). Predominance of some oxides in a rock unfavorably affects the properties of fibers and sometimes makes it impossible to produce fibers (the percentage of Si and Ca affects viscosity of the basalt mass, Al and Fe affect strength of basaltic fiber, Mn and Ti affect its heat stability, K and Na affect the quantity of non-fiber inclusions, etc.). Based on these factors, basaltic fiber is not produced from rocks of any deposit.

The purpose of this invention is to facilitate making it possible to obtain continuous basaltic fiber from rocks of <u>any</u> basalt deposit or deposit of basaltic group. This task was rather difficult and was solved in accordance with the present invention's claim 1 by means of using the

intermediate stabilizing section placed between the furnace and the feeder, and by means of stabilizing the melted basalt glass mass there and in the feeder till the glass mass composition is obtained with the relation of basic constituents given in the application.

In accordance with the method of the invention, the introduced Basalt is melted in the furnace (preferably at the temperature of $1450^{0}C\pm50^{0}C$). The basalt glass melt is non-uniform, it boils and gives off gases, chemical bonds between oxides are unstable. In the stabilizing section the temperature is reduced, bubbles disappear, the surface of the glass melt becomes even and smooth. Here the chemical reactions continue, the composition averages, becomes more uniform and stable. Chemical composition is regulated by temperature in the stabilizing section, by sufficient duration to provide for the stabilization and other factors such as the basalt make up. Following the stabilization section, the glass melt enters the feeder for further averaging and obtaining the composition necessary for producing fibers.

Austin in the US patent 4149866 discloses a method for forming basaltic fibers not from any rock but from definite rocks with known composition. Percentages given in the tables 1, 2 and 3 characterize the raw basalts and not the basalt glass melt, and the influence of ferrous oxide content on the tensile strength is determined. In order to produce the desirable fibers Austin is to chose the appropriate rock having corresponding composition, not rocks from any deposit with different compositions as in the invention. Accordingly, the assertion in the Office Action that the claimed ratios in claim 1 are inherently met is traversed, and respectfully submitted to be unsupported from the referenced disclosure in Austin.

As for Shofner's patent 4343637, the described apparatus is suited only for producing glass fibers and not basalt fibers. Basalts are non-uniform, and their parts have different temperatures of melting and different temperatures of fiber manufactures. There is no any place

for stabilizing of the basalt glass melt in the apparatus of Shofner (reference being made to the bottom surface to exposed glass melt surface height differential in claims 1 and 27, which relationships even further delineates the different chamber arrangement of the furnace upstream from the feeder part).

Applicants further note that in the furnace 12 of Shofner, basalt glass mass is boiling, gas bubbles and foam are forming in a common firing space, and a stabilizing of the nature of the claimed invention is impossible here, and in the feeder basalt glass mass does not have time to stabilize because the melted glass mass is delivered continuously to the grid of orifices.

In the present invention defined in claim 1 the stabilizing section (e.g., 6 in the Figure) exists, which provides a suitable temperature reduction location having some independence from the more volatile melting firing space chamber. Accordingly, under claim 1 of the present invention, the stabilization section cannot be asserted as being a randomly generated part of the firing space, and the stabilizing section 6 <u>is connected</u> with the feeder (page 2, line 15 of the description), so that it cannot be a part of the feeder space. The feeder connection slows down the stream of the melt delivered to the feeder and makes stabilization to a preferred level in the section 6 possible.

Accordingly, it is respectfully submitted that the method of claim 27 features a method involving a stabilization section that is a separated chamber connected with a firing space chamber and with the feeder, as it was shown on the original drawing. Accordingly, the method associated with this arrangement cannot be performed by "<u>a part of the forming space</u>" or "<u>a part of the feeder</u>". Therefore the presence of the claimed stabilizing section is not obvious from Shofner's patent.

Claims 1 and 27 represent the two independent claims pending in this case. As the base combination of Austin and Shofner has been shown to be deficient relative to the methods set out in the independent claims, and since the additional secondary references fail to remedy the noted deficiencies, it is respectfully submitted that these claims and all claims depending therefrom are in condition for allowance.

The above discussion also highlights some addition distinguishing features in the dependent claims of the present invention.

For example, the temperature values in some of the dependent method claims include temperature values that are relative to the distinct sections discussed above. Thus, the assertion that it would have been merely a matter of routine experiment or optimization, is respectfully submitted to be unsupported, as it fails to take into consideration the temperature range distinctions which are due, at least in part, to the distinct sections set forth in the method of the claims. This includes for example the temperature reduction discussion in, for example, claim 1 in going from the firing space chamber to the furnace chamber represented by the stabilizing section.

Moreover, claims 22 and 27 describe multiple heating systems for the respective distinct sections (which are provided in preferred embodiments of the invention) to achieve improved temperature control relative to the distinct sections. A discussion of how the cited art is considered to render obvious this temperature/control difference claimed interrelationship is lacking in the Office Action.

Based on the foregoing, the application is respectfully submitted to stand in condition for allowance, and confirmation of the same is respectfully requested.

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Applicants look forward to receipt of confirmation of allowance of the present application in due course. If for any reason, the present application is not deemed in immediate condition for allowance (e.g., a remaining informality), the Examiner is invited to telephone the undersigned for additional discussion.

If any fees are deemed necessary in connection with this filing, the Examiner is hereby authorized to charge any such fees to Deposit Account No. 02-4300.

Respectfully submitted,

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By ____________________

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Date: July 9, 2002

AMENDMENT AFTER FINAL
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MARKED UP VERSION OF CHANGES MADE

IN THE CLAIMS:

1. (Thrice Amended) A method for producing basalt fibers, comprising the steps of:

preheating basalt;

introducing the preheated basalt into a melting furnace;

heating the basalt in a firing space [defined in part by first interior floor and roof surfaces] chamber of said furnace to form a glass mass, with said firing space chamber having a bottom wall surface on which the glass mass is placed;

providing the glass mass to a stabilizing section of the melting furnace, which stabilizing section [is defined in part by second interior floor and roof surfaces of said furnace with said second interior floor and roof surfaces having lesser height spacing than that of said first interior floor and roof surfaces of the firing space] defines a second furnace chamber having a bottom wall surface on which the glass mass is placed, with the bottom wall surface of said stabilizing section being positioned at a height which is higher than the bottom wall surface of said firing space chamber, and with said stabilizing section [has] having an interior that opens out to the firing space chamber, until the glass mass reaches a fiber manufacturing temperature, and then, introducing the glass mass from the stabilizing section into a feeder by passing the glass mass through a feed port extending between an interior surface of said stabilizing section and the feeder and retaining thc glass mass in the feeder to obtain a glass mass having the composition

$$\frac{Al_2O_3 + SiO_2}{CaO + MgO} \geq 3$$

$$\frac{FeO}{Fe_2O_3} \geq 0.5$$

$$\frac{2Al_2O_3 + SiO_2}{2\,Fe_2O_3 + FeO + CaO + MgO + K_2O + Na_2O} > 0.5\text{; and}$$

forming fibers by pulling the glass mass from spinnerets which receive glass from the feeder.

2. (Twice Amended) A method according to claim 1 wherein the preheating step heats the basalt to a temperature of 150-900°C[, and providing the glass mass to the stabilizing section includes providing the glass mass to a stabilizing section that has a height .4 to .6 times that of the firing space].

22. (Twice Amended) A method according to claim 1 further comprising heating the glass mass while in each of said firing space <u>chamber</u>, stabilizing section and feeder, and wherein each of said firing space <u>chamber</u>, stabilizing section and feeder have a heating system.

25. (Twice Amended) A method according to claim 22 wherein providing the glass mass to the stabilizing section includes feeding the glass mass to a stabilizing section having [an interior height between the second floor and roof surfaces] <u>a bottom wall surface to glass mass exposed upper surface height</u> that is .4 to .6 times <u>a bottom wall surface of</u> the firing space <u>chamber to the glass mass exposed upper surface</u> height [between the first floor and roof surfaces].

26. (Twice Amended) A method according to claim 1 wherein providing the glass mass to the stabilizing section includes feeding the glass mass to a stabilizing section having [an interior height between the second floor and roof surfaces] <u>a bottom wall surface to glass mass exposed upper surface height</u> that is .4 to .6 times <u>a bottom wall surface of</u> the firing space

chamber to the glass mass exposed upper surface height [between the fist floor and roof surfaces].

27. (Amended) A method for producing basalt fibers, comprising the steps of:

preheating basalt;

introducing the preheated basalt [into] onto a bottom wall surface of a firing space chamber of a melting furnace;

heating the basalt in [a] said firing space [defined in part by first interior floor and roof surfaces of] chamber provided in said furnace to form a glass mass;

providing the glass mass to a stabilizing section of the melting furnace, which stabilizing section [is defined in part by second interior floor and roof surfaces of said furnace with said second interior floor and roof surfaces having lesser height spacing than that of said first interior floor and roof surfaces of the firing space and] defines a separate, second furnace chamber having a bottom wall surface at a higher level than the bottom wall surface of said firing space chamber and with said stabilizing section [has] having an interior that opens out to the firing space chamber, until the glass mass reaches a stabilizing section temperature which is a reduced temperature relative to a heating temperature in said firing space chamber, and then, introducing the glass mass from the stabilizing section into a feeder by passing the glass mass through a feed port extending between an interior surface of said stabilizing section and the feeder and retaining the glass mass in the feeder, and then forming fibers from glass mass derived from said feeder.

28. (Amended) A method according to claim 27 wherein providing the glass mass to the stabilizing section includes feeding the glass mass to a stabilizing section having [an interior height between the second floor and roof surfaces] a bottom wall surface to glass mass

exposed upper surface height that is .4 to .6 times a bottom surface of the firing space chamber to the glass mass exposed upper surface height [between the first floor and roof surfaces].

29. (Amended) A method according to claim 27 further comprising heating the glass mass while in each of said firing space chamber, stabilizing section and feeder, and wherein each of said firing space chamber, stabilizing section and feeder have an individual heating system (7).

IN THE SPECIFICATION:

Page 4, first full paragraph bridging pages 4 and 5:

The technical result is obtained in a device for producing basaltic fibers, which includes a basalt weigher, a melting furnace, a feeder with discharging devices, feeding units, spinnerets, mechanisms for applying oil, and mechanisms for reeling the fibers up onto bobbins. According to the invention, a heat exchanger connects the basalt weigher with a firing space of the melting furnace, and the melting furnace has a stabilizing section for stabilizing the melted glass mass. The stabilizing section is connected with the feeder. The best technical result is attained when the height of the stabilizing section 0.4 – 0.6 of the height of the [inner space] height of the basin of the furnace. A heat exchanger preliminary heats the basalt before it is charged into the furnace. The glass mass is stabilized to obtain glass mass composition with the relation of basic constituents

$$\frac{Al_2O_3 + SiO_2}{CaO + MgO} \geq 3$$

$$\frac{FeO}{Fe_2O_3} \geq 0.5$$

$$\frac{2Al_2O_3 + SiO_2}{2\,Fe_2O_3 + FeO + CaO + MgO + K_2O + Na_2O} > 0.5,$$

making it possible to remove crystal water, gas bubbles and foam, to stabilize the volume of the glass mass to obtain an even and smooth surface, and to ensure the stability of the temperature range and viscosity which is essential for fiber manufacture. The presence of a heat exchanger in the weigher on simultaneous charging ensures uniform heating throughout the volume of basalt by the reduction of hot air flowing from the firing space of the melting furnace, enabling the utilization of waste gases and the reduction of fuel consumption. The stabilizing section which has a height of 0.4 – 0.6 of the height of the basin of the furnace [interior space] contributes to stabilizing the melt in volume at the furnace exit with a specified temperature. The stabilizing section height is determined by the melt height as the temperature decreases, and the possible exit of gases and foam.

AMENDMENT AFTER FINAL
U.S. Appln. No. 09/314,001

CLEAN VERSION OF CHANGES MADE

IN THE CLAIMS:

1. (Thrice Amended) A method for producing basalt fibers, comprising the steps of:

preheating basalt;

introducing the preheated basalt into a melting furnace;

heating the basalt in a firing space chamber of said furnace to form a glass mass, with said firing space chamber having a bottom wall surface on which the glass mass is placed;

providing the glass mass to a stabilizing section of the melting furnace, which stabilizing section defines a second furnace chamber having a bottom wall surface on which the glass mass is placed, with the bottom wall surface of said stabilizing section being positioned at a height which is higher than the bottom wall surface of said firing space chamber, and with said stabilizing section having an interior that opens out to the firing space chamber, until the glass mass reaches a fiber manufacturing temperature, and then, introducing the glass mass from the stabilizing section into a feeder by passing the glass mass through a feed port extending between an interior surface of said stabilizing section and the feeder and retaining the glass mass in the feeder to obtain a glass mass having the composition

$$\frac{Al_2O_3 + SiO_2}{CaO + MgO} \geq 3$$

$$\frac{FeO}{Fe_2O_3} \geq 0.5$$

providing the glass mass to a stabilizing section of the melting furnace, which stabilizing section defines a separate, second furnace chamber having a bottom wall surface at a higher level than the bottom wall surface of said firing space chamber and with said stabilizing section having an interior that opens out to the firing space chamber, until the glass mass reaches a stabilizing section temperature which is a reduced temperature relative to a heating temperature in said firing space chamber, and then, introducing the glass mass from the stabilizing section into a feeder by passing the glass mass through a feed port extending between an interior surface of said stabilizing section and the feeder and retaining the glass mass in the feeder, and then forming fibers from glass mass derived from said feeder.

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28. (Amended) A method according to claim 27 wherein providing the glass mass to the stabilizing section includes feeding the glass mass to a stabilizing section having a bottom wall surface to glass mass exposed upper surface height that is .4 to .6 times a bottom wall surface of the firing space chamber to the glass mass exposed upper surface height.

29. (Amended) A method according to claim 27 further comprising heating the glass mass while in each of said firing space chamber, stabilizing section and feeder, and wherein each of said firing space chamber, stabilizing section and feeder have an individual heating system (7).

<u>IN THE SPECIFICATION:</u>

Page 4, first full paragraph bridging pages 4 and 5:

F3 Sub G2

The technical result is obtained in a device for producing basaltic fibers, which includes a basalt weigher, a melting furnace, a feeder with discharging devices, feeding units, spinnerets, mechanisms for applying oil, and mechanisms for reeling the fibers up onto bobbins. According

to the invention, a heat exchanger connects the basalt weigher with a firing space of the melting furnace, and the melting furnace has a stabilizing section for stabilizing the melted glass mass. The stabilizing section is connected with the feeder. The best technical result is attained when the height of thc stabilizing section 0.4 – 0.6 of the height of the height of the basin of the furnace. A heat exchanger preliminary heats the basalt before it is charged into the furnace. The glass mass is stabilized to obtain glass mass composition with the relation of basic constituents

3

$$\frac{Al_2O_3 + SiO_2}{CaO + MgO} \geq 3$$

$$\frac{FeO}{Fe_2O_3} \geq 0.5$$

$$\frac{2Al_2O_3 + SiO_2}{2\,Fe_2O_3 + FeO + CaO + MgO + K_2O + Na_2O} > 0.5,$$

making it possible to remove crystal water, gas bubbles and foam, to stabilize the volume of the glass mass to obtain an even and smooth surface, and to ensure the stability of the temperature range and viscosity which is essential for fiber manufacture. The presence of a heat exchanger in the weigher on simultaneous charging ensures uniform heating throughout the volume of basalt by the reduction of hot air flowing from the firing space of the melting furnace, enabling the utilization of waste gases and the reduction of fuel consumption. The stabilizing section which has a height of 0.4 – 0.6 of the height of the basin of the furnace contributes to stabilizing the melt in volume at the furnace exit with a specified temperature. The stabilizing section height is determined by the melt height as the temperature decreases, and the possible exit of gases and foam.